

Kettle Pond Data Atlas: Paleoecology and Modern Water Quality

Glossary of Terms

- Alkalinity.** The ability of water to resist acidification. In the kettle ponds, alkalinity is largely provided by bicarbonate ions.
- Anadromous.** Fish that spend most of their adult life in the sea but spawn in fresh waters. River herring are the local example.
- Anions.** Dissolved elements or compounds that make water more acid; they include sulfate, nitrate and organic compounds.
- Anoxia.** The lack of dissolved oxygen in water. Oxygen is a requirement of most aquatic life.
- Bathymetry.** The measurement and mapping of the pond bottom, essentially the depth of submerged lands.
- Benthic.** Occurring on or in the pond sediment.
- Biogeochemistry.** The study of the cycling of chemical elements throughout ecosystems. For example, nutrients and other elements cycle through the atmosphere, surface waters, sediment, and living things.
- Biomass.** The amount (weight) of living tissue, for example, phytoplankton biomass usually expressed as milligrams per unit volume of pond water.
- Cations.** Dissolved metallic elements like calcium and magnesium that can neutralize acidity in water.
- Chlorophyll.** A green pigment used by algae and plants to capture solar energy for photosynthesis. The chlorophyll content of a known volume of pond water is used to represent primary productivity.
- Cladocera.** Small crustacean invertebrates (commonly called “water fleas”) that swim in the water column and feed on drifting algae and other organic particles. They are eaten in turn by larger invertebrates and especially fish.
- Conductivity.** A measure of the amount of dissolved substances in water, determined by the water’s capacity to conduct an electric charge. All of the dissolved substances contribute to a water’s conductivity.
- Cultural eutrophication.** An increase in organic loading of a pond due to human activities. For example, phosphorus from shoreline septic systems may leach into a pond stimulating algae growth and the accumulation of organic matter in both water and sediment.
- Denitrification.** A bacterial process that converts nitrate to nitrogen gas, thus removing nitrates from a pond system and eliminating the acidifying, and perhaps fertilizing, effects.
- Diatoms.** A group of single-celled alga having silica (glass-like) cell walls (frustules). Diatom species can be identified by their distinctive frustules which survive for

millennia in pond sediment and can be used to determine the ancient chemical environments of each pond. Scientists identify and count diatom remains in sediments to reconstruct ancient environments.

Edaphic. Of or related to the soil. Soils can affect pond water quality directly; e.g. Cape soils contain little phosphorus or acid-neutralizing chemicals, making the ponds especially sensitive to the addition of phosphorus or acidity. Soils can also affect the pondwater indirectly; e.g. acidic and nutrient-poor Cape soils foster the growth of pine and oak woodlands that contribute organic acids to the kettle ponds.

Eutrophic. Condition of a water body in which organic matter production is high, usually due to abundant plant nutrients. Visible indicators of a eutrophic pond include cloudy water and lush shoreline plant growth.

Eutrophication. A process in which increasing amounts of organic matter are produced by plants and algae, usually fed by the increased supply of nutrients, particularly phosphorus in fresh water ponds and lakes. Phosphorus from both natural and human-development sources causes algae blooms.

Gyttja. Highly organic lake mud, usually found in the deepest pond basins and of the color and consistency of chocolate pudding.

Hydrogeology. The integrated study of groundwater, surface water and the geologic features containing both.

Hypolimnetic anoxia. Deep-water depletion of dissolved oxygen which usually occurs in the summer because of organic loading and stagnation of pond bottom waters.

Hypolimnion. The bottom waters; that portion of the pond water column below the level of temperature stratification.

Hypoxia. A scarcity of dissolved oxygen in the water column.

Ion. A dissolved chemical having a positive or negative charge.

Ionic strength. The total concentration of all ions in solution, directly related to electrical conductivity.

Isotope. Any of two or more forms of a chemical element having different numbers of neutrons in the nucleus. Plants, animals and even the pond water can contain isotopic tags that identify the sources of their constituent elements, e.g. carbon, nitrogen or sulfur..

Kettle pond. A pond formed in a depression on the land surface left by an ice block after glacial retreat. Kettle ponds have rounded bottoms like the cooking vessels of the same name. Some ice-block depressions are dry, simply because they are not deep enough to reach the water table.

Limnetic. Referring to a pond's deep waters.

Limnology. The study of lakes, ponds and streams including physical, chemical and biological processes.

Littoral. Referring to the shallow water.

Macrophytes. Aquatic plants rooted in pond sediment and often partly or completely submerged..

Mesotrophic. Condition of a pond or lake in which organic matter production is moderate, commensurate with the supply of plant nutrients.

Moraine. A ridge formed from material dropped by a melting glacier and usually containing a mixture of particle sizes from clay to boulders.

Oligotrophic. Referring to a pond that is low in phosphorus and drifting algae and therefore very clear. The production of organic matter is low.

Outwash. Layered soil deposited by glacial meltwater streams. Outwash consists of mostly sand and gravel.

Paleoecology. The study of ancient ecosystems, in the case of the kettle ponds using sediments to describe historic and prehistoric pond chemistry and biology.

Paleolimnology. The study of ancient pond environments, usually through the extensive study of sediment.

pH. A measure of the intensity of acidity, actually the negative logarithm of the hydrogen ion concentration, of pond water. Acid waters have a pH less than 7.0; alkaline waters have pH greater than 7.0.

Phosphorus. An essential nutrient for plant and algae growth. Phosphorus is the nutrient in shortest supply in the kettle ponds and therefore limits plant and algae growth. Low concentrations of phosphorus in Cape ponds account for their clarity.

Photic zone. That portion of a pond's water column that receives enough light to support plant and algal growth.

Phytoplankton. Microscopic, photosynthetic algae and bacteria that drift or swim weakly within the water column.

Post-glacial. Occurring after the onset of glacial retreat which began on Cape Cod about 18,000 years ago.

Primary productivity. The rate of organic matter production by photosynthetic algae, plants, and bacteria. High production of organic matter is beneficial in agriculture **and salt marshes**, but not in ponds where organic loading can cloud the water and deplete dissolved oxygen.

Secchi disk. A 20-centimeter diameter black and white disk which is lowered into a pond to determine water clarity. The depth at which the suspended disk just disappears is called the "Secchi depth".

Secchi transparency. The depth in the water column at which a 20-centimeter black and white disc just disappears from the view of an observer at the pond surface.

Sorption. The chemical removal of dissolved substances by adhesion to soil or sediment solids. For example, the sorption of phosphate to oxidized iron minerals on a pond bottom is a natural mechanism that reduces phosphorus pollution and eutrophication.

Stratification. Separation of the pond water column into layers of different temperature and, thus, density; This process typically occurs in summer, inhibits vertical mixing, and leads to oxygen depletion in the bottom waters.

Trophic status. The position of a pond along a gradient in the production of organic matter ranging from oligotrophic to eutrophic in increasing order of organic production. See eutrophication.

Trophic structure. The organization of plants, animals and microbes into groups based on their function within the ecosystem. For example, photosynthetic algae and plants are the first level in a pond's trophic structure; the invertebrate animals that graze on them are the second level; predacious fish, or the birds or humans that eat them, are at the top of the trophic structure.

Water column. The entire vertical shaft of water in a pond from the sediment to the water's surface. The water column of most Cape lakes becomes stratified into layers of different temperature and, thus, density as summer progresses.

Zooplankton. Tiny invertebrate animals, usually less than one millimeter, that drift and swim weakly within the water column.